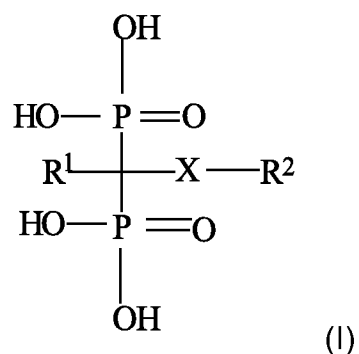


Claims

1. Bisphosphonic acid of the general formula (I)



wherein

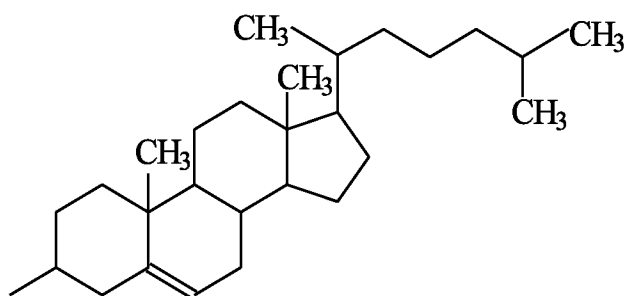
R^1 is H, OH, $\text{C}_1\text{-C}_6$ alkyl, $\text{C}_1\text{-C}_6$ alkoxy, $\text{C}_1\text{-C}_6$ hydroxyalkyl, $\text{C}_1\text{-C}_6$ aminoalkyl, $\text{C}_1\text{-C}_6$ halogen alkyl,

X is a direct bond, alkylene group with 1 to 20 carbon atoms, $(\text{CH}_3)_m\text{-(OCR}^3\text{HCH}_2)_n\text{-(O)}_o\text{-}$, wherein R^3 is H or CH_3 and m is 0 or a number from 1 to 6, n is a number from 1 to 10, preferably 1 to 6, and o is 0 or 1,

$\text{-(CR}^4\text{HCH}_2\text{O)}_p\text{-}$, wherein R^4 is H or CH_3 , p is a number from 1 to 10, preferably 1 to 6,

$(\text{CH}_3)_q\text{-(OCR}^5\text{HCH}_2)_r\text{-(O)}_s\text{-(CH}_3)_t\text{-}$, wherein R^5 is H or CH_3 and q is 0 or a number from 1 to 6, r is a number from 1 to 10, preferably 1 to 6, and s is 0 or 1, and t is a number from 1 to 6,

R^2 is a group of the formula (II)



(II)

or a fatty alkyl group or a fatty acid group having 8 to 22 carbon atoms,

as well as their physiologically compatible derivatives, in particular salts and trimethyl silyl derivatives.

2. Bisphosphonic acid according to claim 1, wherein R^1 is OH and R^2 is a group that corresponds to the general formula (II).
3. Use of the bisphosphonic acids according to claim 1 as a chelating agent or transport agent for divalent and trivalent metal ions in technical and industrial applications, as a corrosion protection agent in technical and industrial applications, as a pharmaceutical agent, as an additive for active agent transport or as a diagnostic agent.
4. Use according to claim 3, characterized in that the compound of the general formula (I) is bonded to an active agent or a diagnostic agent.
5. Use according to claim 3 or 4, characterized in that the active agent or the diagnostic agent is selected from therapeutic cancer agents, virustatic agents, antibiotics, antimycotic agents, anti-inflammatory agents, substances that stimulates bone tissue or suppress bone tissue.

6. Use according to one of the claims 3 to 5 in combination with or as a component of liposomes, nanoparticles, nanospheres, nanocapsules, micelles, or polymer systems.
- 5 7. Method for preparing the compounds of the formula I in which a compound of the formula III, $R^2\text{-X-COOH}$ or a reactive derivative thereof, is reacted in a way known in the art with the bisphosphonic acid or tris(trimethylsilyl) phosphite and the obtained product is isolated directly or is converted by hydrolysis into the free phosphonic acid.
- 10 8. Liposomal composition comprising a compound of the general formula I, phospholipids and/or a uronic acid derivative.
9. Liposomal composition according to claim 8, characterized in that as a uronic acid derivative palmityl-D-glucuronide and/or galactosyl-D-glucuronide are contained in concentrations of 0.1 mol % to 25 mol %.
- 15 10. Liposomal composition according to claim 8 or 9, characterized in that the phospholipids are selected from phosphatidyl choline, phosphatidyl glycerol, phosphatidyl ethanolamine, phosphatidyl inositol, phosphatidyl acid, sphingomyelin, ceramide in their natural, semi-synthetic or synthetic forms as well as stearyl amine and cholesterol.
- 20 11. Liposomal composition according to one of the claims 8 to 10, characterized in that it is present as an aqueous dispersion or as a lyophilisate.
- 25 12. Method for producing a liposomal composition according to the claims 8 to 11, wherein a raw mixture of the individual components such as palmityl-D-glucuronide, phospholipids, bisphosphonic acid(s) or a derivative thereof of the general formula (I) and any individual active substance or combination of active substances are mixed with one another by ultrasound, high-pressure extrusion, or high-pressure

homogenization.

13. Use of a liposomal composition according to claim 8 to 11, for preparing a medicament for treating human diseases and animal diseases.